

What is claimed is:

1. A recombinant virus which comprises at least one foreign nucleic acid inserted within a non-essential region of the viral genome of a virus, wherein each such foreign nucleic acid (a) encodes a protein selected from the groups consisting of a feline CD28 protein or an immunogenic portion thereof; a feline CD80 protein or an immunogenic portion thereof; a feline Cd86 protein or an immunogenic portion thereof; or a feline CTLA-4 protein or an immunogenic portion thereof and (b) is capable of being expressed when the recombinant virus is introduced into an appropriate host.
2. The recombinant virus of claim 1 which comprises at least two foreign nucleic acids, each inserted within a non-essential region of the viral genome.
3. The recombinant virus of claim 2 which comprises at least three foreign nucleic acids, each inserted within a non-essential region of the viral genome.
4. The recombinant virus of claim 3 which comprises four foreign nucleic acids, each inserted within a non-essential region of the viral genome.
5. The recombinant virus of claim 1, wherein the virus is raccoonpox virus, a swinepox virus, or a feline herpesvirus.
6. The recombinant virus of any of claim 1-5 comprising more than one foreign nucleic acid, wherein each foreign nucleic acid is inserted into the same nonessential region.
7. The recombinant virus of any claims 1-5 comprising more than one foreign nucleic acid wherein all

such foreign nucleic acids are not inserted into the same nonessential region.

- 5        8.    The recombinant virus of any of claim 1-7 further comprising a foreign nucleic acid encoding an immunogen derived from a pathogen.
9.    The recombinant virus of claim 8, wherein the pathogen is a feline pathogen, a rabies virus, Chlamydia, Toxoplasmosis gondii, Dirofilaria immitis, a flea, or a bacterial pathogen.
- 10      10.   The recombinant virus of claim 9, wherein the feline pathogen is feline immunodeficiency virus (FIV), feline leukemia virus (FeLV), feline infectious peritonitis virus (FIP), feline panleukopenia virus, feline calicivirus, feline reovirus type 3, feline rotavirus, feline coronavirus, feline syncytial virus, feline sarcoma virus, feline herpesvirus, feline Borna disease virus, or a feline parasite.
- 15      11.   The recombinant virus of any of claim 1-7, wherein at least one foreign nucleic acid comprises a promoter for expressing the foreign nucleic acid.
- 20      12.   The recombinant virus of any claims 1-7, wherein the expression of a least one foreign nucleic acids is under the control of a promoter endogenous to the virus.
- 25      13.   The recombinant virus of any of claims 1-10 further comprising a foreign nucleic acid encoding a detectable marker.
- 30      14.   The recombinant virus of claim 13, wherein the detectable marker is E.coli beta galactosidase.

15. The recombinant virus of claim 10, wherein the immunogen from a feline pathogen is FIV gag protease, a FIV envelope protein, a FeLV gag protease, or a FeLV envelope protein.
- 5 16. The recombinant virus of any claims 1-7, wherein the virus is a feline herpesvirus and the a nonessential region is the glycoprotein G gene of feline herpes virus.
- 10 17. The recombinant feline herpesvirus of claim 12 designated S-FHV-031 (ATCC Accession No. VR-2604).
- 15 18. The recombinant virus of any of claim 1-7, wherein the virus is swinepox virus and the nonessential region is the larger Hind III to Bgl II subfragment of the Hind III M fragment of swinepox virus.
- 20 19. The recombinant feline swinepox of claim 14 designated S-SPV-246 (ATCC Accession No. VR-2603).
- 25 20. The recombinant virus of any of claims 1-7, wherein the portion of the CD28, CD80, or CD86 protein is the soluble portion of the protein.
- 30 21. The recombinant virus of any of claims 1-7, where the foreign nucleic acid encodes the feline CTLA-4 protein.
22. A vaccine which comprising an effective immunizing amount of the recombinant virus of any of claims 1-19 and a suitable carrier.
23. The vaccine of claim 22, wherein the effective immunizing amount of the recombinant virus is an amount between about  $1 \times 10^5$  pfu/ml and about  $1 \times 10$  cfu/ml.

24. The vaccine of claims 22 which further comprises an admixture with the recombinant virus an effective immunizing amount of an a second immunogen.
- 5 25. A method for enhancing an immune response in a feline which comprises administering to the feline an effective immunizing amount of the recombinant virus of any of claims 1-19.
- 10 26. A method for immunizing a feline which comprising administering to the feline an effective immunizing amount of the recombinant virus of any of claims 1-19.
- 15 27. A method for suppressing an immune response in a feline which comprises administering to the feline any effective suppressing amount of the recombinant virus of claim 20 or 21.
- 20 28. The method of any of claims 24-26, wherein the administering comprises intravenous, subcutaneous, intramuscular, transmuscular, topical, oral, or intraperitoneal administration.
- 25 29. The method of claim 27, wherein the feline is the recipient of a transplanted organ or tissue or is suffering from an immune response.
- 30 30. A method for suppressing an immune response in a feline which comprises administering to the feline an antisense nucelic acid capable of hybridizing to and inhibiting translation of: (a) a feline CD28 mRNA transcript, (b) a feline CD80 transcript, or (c) a feline CD86 mRNA transcript the antisense nucleic acid being present in an amount effective to inhibit translation and thus suppress the immune response in the feline.

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31. A method for reducing or abrogating a tumor in a feline which comprises administering to the tumor in the feline a recombinant virus of claim 1, wherein the nucleic acid encodes a feline CD80 protein, a feline CD86 protein or a combination thereof in an amount effective reduce or abrogate the tumor.
32. The method of claim 31, wherein the recombinant virus further comprises, and is capable of expressing, a feline tumor associated antigen and the administration is effected systemically.
33. The recombinant virus of claim 1, further comprising a nucleic acid encoding feline immunodeficiency virus genome or a portion thereof.
34. The recombinant virus of claim 1, further comprising a nucleic acid encoding feline leukemia virus genome or a portion thereof.
35. The recombinant virus of claim 33 or 34, further comprising a nucleic acid encoding feline IL12, p35 or p40.
36. A vaccine which comprises an effective immunizing amount of the recombinant virus of claim 33 or 34 and a suitable carrier.

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